

E3/4

SANITARY
ARRANGEMENTS
OF
DWELLING HOUSES.

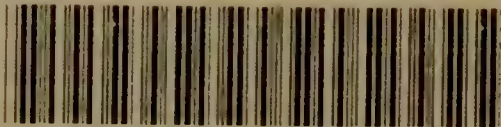
BY
MARK H. JUDGE.



~~D 3~~
J 3

Parkes Museum
(London)

From
The Sanitary Assurance Association.



22101879017

Med

K22881

SANITARY ARRANGEMENTS
OF
DWELLING HOUSES.

THE "FREEMASON" PRINTING WORKS,

16 & 16A GT. QUEEN ST., LINCOLN'S-INN-FIELDS, LONDON, W.C.

SANITARY ARRANGEMENTS

OF

DWELLING HOUSES.

NOTES IN CONNECTION WITH THE SANITARY EXHIBITS AT
THE INTERNATIONAL HEALTH EXHIBITION, 1884.

BY

MARK H. JUDGE,, A.R.I.B.A.,
Surveyor of the Sanitary Assurance Association.

LONDON :
SANITARY ASSURANCE ASSOCIATION, 5 ARGYLL PLACE, W.

1884.



WELLCOME INSTITUTE LIBRARY	
Coll.	wellcome
Call	
No.	WIA

PREFACE.

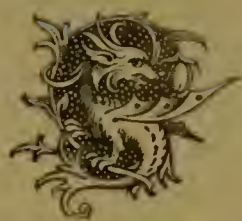
THE following notes were written in compliance with a request of the Council of the Sanitary Assurance Association, that I should visit the International Health Exhibition and report to the Association upon those exhibits which are more or less connected with its work, viz. :—the promoting and maintaining of good sanitary arrangements in the dwellings of all classes of the community.

The notes are confined to House Drains, Water Closets, Urinals, Baths, Lavatories, Sinks, and Water Service Appliances of the Dwelling House ; all of which are specially within the province of the Architect ; the notes are now published, by desire of the Council.

MARK H. JUDGE.

8 *Park Place Villas, Paddington, W.*

July, 1884.





CONTENTS.

Pipes now disused for House Drains	1
Pipes now used for House Drains	2
Connections with House Drains	4
Disconnection of House Drains	6
Ventilation of House Drains	8
Valve Water Closets	9
Pan Water Closets	12
Plug Water Closets	12
Hopper Water Closets	12
“ Wash-out ” Water Closets	13
Trough Water Closets	14
Water Closet Traps	15
Soil Pipes	15
Chamber-Slop Sinks	15
Urinals	16
Baths	16
Lavatories	17
Washing Sinks	18
Waste Pipes	18
Store Cisterns	19
Flushing Cisterns	20
Overflow Waste Pipes	20
Safe-Trays	21
Rain Water Pipes	21
Conclusion	21

APPENDIX.

THE SANITARY ASSURANCE ASSOCIATION.





SANITARY ARRANGEMENTS OF DWELLING HOUSES.

NOTES IN CONNECTION WITH THE SANITARY EXHIBITS AT
THE INTERNATIONAL HEALTH EXHIBITION, 1884.

PIPES NOW DISUSED FOR HOUSE DRAINS.

AN interesting example of a drain pipe now no longer used, is exhibited at the International Health Exhibition by Mr. John Waldram, C.E. It is a plain piece of oak 6 feet 6 inches long, about $7\frac{1}{2}$ inches square, with hole through centre from end to end about $3\frac{1}{2}$ inches in diameter. This is one of a number of similar pipes recently removed from the site of Hatchett's Hotel in Piccadilly, after having for upwards of a hundred years failed to perform the duty ignorantly put upon them, and against which they had been protesting from the first by habitually depositing the sewage in the surrounding soil instead of carrying it away. This exhibit affords tangible evidence of the lamentable ignorance of sanitary laws that prevailed a century ago.

There does not appear to be on view any other example of old forms of drains now no longer put in, such as brick drains, tile drains, and wood box drains.

The Old London Street, which is one of the most attractive features of the Exhibition, might with advantage to the interests of Health be supplemented by the basement of an old London House, showing in section

the leaky drains and the large cesspools which, being underground, have not been replaced by modern improvements, as have the low-roomed, gable-roofed picturesque houses so faithfully reproduced by Mr. George Birch, A.R.I.B.A. Thousands of houses in London and other large towns stand on a network of brick, wood, and tile apologies for drains; and could the occupants of such houses only realise the fearfulness and extent of the dangers which thus surround them, they would not be content to remain a day longer than absolute necessity compelled. An actual representation of the state of things existing under their habitations would be more eloquent than any description from the pen of the ablest writer. No words of the architect are required to demonstrate the necessity of having a protecting rail or balustrade to a nursery balcony, and a like necessity for protection from the imminent danger to life connected with leaky drains and stagnant cesspools would be evident to the meanest capacity when once the actual condition of these drains and cesspools was realised.

PIPES NOW USED FOR HOUSE DRAINS.

Drain pipes are now made of stoneware, concrete or artificial stone, and iron. Stoneware must, I think, always retain its superiority over concrete or iron, as, when well glazed and made of sufficient strength, it fulfils all the requirements of a perfect drain. It is impenetrable by air or water; it permits of perfectly air-tight and water-tight joints being made between pipe and pipe, so that the drain when finished may be practically one pipe; it is imperishable in use, and can only be destroyed by absolute breakage. The next best material to stoneware for pipes is concrete or artificial stone, but this material is more suitable for pipes of large size, such as public sewers. Iron is not the best material for house drains, for the reason that the most careful jointing will

not remain perfect, and that the surface of cast iron is not sufficiently smooth to carry away sewage quickly or completely. When iron drains are laid under houses, they can only be guaranteed to remain satisfactory when cased with concrete, but with stoneware drains concrete is only necessary where the soil cannot be depended upon as a foundation. Where the house drains can be kept above the bed of concrete, which should cover the area enclosed by the external walls of the house, the drains under the house should be so laid that every pipe and junction may be seen when required, without earth having to be dug away or concrete to be cut through. In no case should metal pipes be joined to stoneware inside the house, as sooner or later such joints must become defective.

Excellent stoneware drain pipes are exhibited by the following manufacturers:—Messrs. Bailey and Co., Messrs. Candy and Co., Messrs. Joseph Cliff and Sons, Messrs. J. and M. Craig, Messrs. Henry Doulton and Co., Mr. Joseph J. Ellis, Messrs. W. Ingham and Sons, Mr. Geo. Jennings, Messrs. Sharp, Jones, and Co., Messrs. J. Stiff and Sons, and Messrs. Wilcock and Co.

Well-made concrete or artificial stone pipes are exhibited by the Imperial Stone Company and Messrs. Sharp, Jones, and Co.; and iron drain pipes are shown by the North British Plumbing Company.

Stanford's well-known patent joint for stoneware drains is exhibited by Mr. Henry Ough, C.E. No cementing is required with Stanford's patent joint. The joint is formed of a composition which is attached to the stoneware in the factory; each plain end and socket is turned and bored, and a perfect joint is made by the plain ends and sockets being greased before the pipes are put together.

Two other patent joints are shown, one by Major Francis H. Noot. This joint simply consists of the ordinary socket being formed partly on one pipe and

partly on another, so that one pipe is laid on to another instead of into it. There are thus two joints in the socket, and as these joints are square, they remain weak points in the drain. Major Noot's patent is really a variation, and not an improvement, of the principle first introduced by Mr. Geo. Jennings more than twenty years ago in his patent pipes without sockets, the sockets being formed in separate chair and saddle pieces, in which each pipe rests. Jennings's patent drain pipes have an advantage over the ordinary socket pipes for export, owing to the great economy of space effected in their stowage; but for good construction and sound work nothing can compare with the ordinary socket joint pipes. Roberts's patent joint, exhibited by Messrs. Bailey and Co., is an ingenious arrangement. The joint is made by means of a loose collar, tapered on the inside, which is passed over the ends of two pipes having projecting rings to fit the collar. There is no reason why good joints should not be made by this means, but no complicated mode of joining drain pipes is likely to supersede the simple socket, with a joint of Portland cement or other material that will adhere to stoneware as that used in Stanford's patent joint.

CONNECTIONS WITH HOUSE DRAINS.

All connections with house drains should be outside the house, and the only pipes which should be directly connected to house drains are soil pipes and ventilating pipes. Rain water, waste water, and surface drainage should pass into the house drain through some kind of trap, of which there are many varieties shown. The manufacturers before mentioned all exhibit stoneware siphon gully traps, which are now, happily, coming into common use in connection with the drainage of even the smallest houses.

One hardly expected to find a place of honour given to the Bell Trap, but in the South Annexe these enemies

to health are exhibited by Mr. R. W. Crosthwaite. These traps are carefully galvanized, so that where used they may last as long as possible, and be a permanent source of danger, under a friendly guise, to the unfortunate inmates of the dwellings in which they are fixed. It was satisfactory to find on reference to the catalogue no mention made of bell traps in the description of Mr. Crosthwaite's exhibits, and it is to be hoped that the Executive Council will have these old offenders against sanitary laws removed from the Exhibition, or shown only in connection with the Unsanitary House.

The "Desideratum Gully," exhibited by Messrs. Bailey and Co., is well made and of good design, excellently suited for receiving stable drains or waste pipes from Scullery sinks. It is fitted with an iron trough, which retains straw, sand, grease, and other refuse; the removal of which is effected by lifting out the trough.

Strong iron gullies suitable for warehouses and other places where very great strength is required are exhibited by Messrs. Fredk. Bird and Co.

Dean's patent stoneware gullies are exhibited by Mr. Henry Dean. These gullies are unusually deep, are fitted with bucket for easy removal of silt, &c., and are very useful on this account.

"Reversible Inlet Gullies," designed some years ago by me, are exhibited by Messrs. Henry Doulton and Co. They are made in two pieces, the head, or receiver, fitting into the trap, so that while the head is fixed square with the paving the trap may be placed at any angle most convenient for connection with the drain. Hellyer's excellent "Drain Interceptors," or gullies, are also exhibited by Messrs. Doulton and Co.

The "Improved Gully" and the "Interceptor Gully," exhibited by Messrs. Houghton and Co. are excellent traps. The "Interceptor" is a specially well-designed trap, admirably suited for stables, gravel paths, &c.

The "Weatherley Trap," or gully, is exhibited by

Messrs. Stiff and Sons in an improved pattern, in which the inlet and outlet pipes are outside instead of inside the well of the trap, and thus the well is free from projections for the lodgment of filth.

DISCONNECTION OF HOUSE DRAINS.

Arrangements for providing a free passage of air into drains on the house side of outfall traps, to form an air break or disconnection between sewers and house drains, are now admitted to be necessary by all sanitary authorities; indeed, the principle involved in their use is the cardinal principle of modern sanitary architecture. By means of the outfall siphon trap, combined with air disconnection and outlet ventilation above the roof, a dwelling is thoroughly protected from the ingress of sewer air. That it is important that the admission of sewer air to our dwellings should be prevented is univorsally admitted, even when no infectious disease germs are present in the sewers, but it is often a matter of life and death. Who, indeed, would be bold enough to assert that the miles of London sewers into which every house is supposed to drain in this great Metropolis, with its four millions of inhabitants, is ever free from infectious disease germs? These sewers drain alike the palace and the worst tenement dwelling in which poverty and ignorance breed disease and invite death. With perfect house drains, properly disconnected from the sewer, the inhabitants of a town dwelling may enjoy the blessings attendant upon cleanliness; but without such disconnection from the public sewer the cleanest possible household must share the dangers resulting from the sins of others against the laws of health.

Messrs. Bailey and Co. exhibit siphon traps with large inspection hole for access to sewer, designed by Mr. Rogers Field, M. Inst. C.E.; also channel pipes of various forms by the same engineer for air-chambers or disconnecting manholes. The inlet to Mr. Field's traps

is at an angle of about 45 degrees from the level of the water in the trap, so that the area of water is much larger than with traps in which the inlet is vertical. With Mr. Field's channel pipes, which are extremely good specimens of stoneware manufacture, the air-chamber floors above the channels have to be constructed separately by the workman when building the chamber, and are finished in cement, so that the floor is of two materials, and special care has to be taken that the cement work is well done.

The Birmingham Sanitary Association exhibits the Edinburgh Air-chambered Trap, admirably made by Messrs. Cliff and Sons, and designed by the late Mr. Robert Potts. This is a good disconnecting arrangement, and, being made of earthenware throughout, the risks attending cement rendered floors or sides are avoided. Its one defect is the inaccessibility of the trap, which is a serious fault when the trap is fixed at any considerable depth.

Messrs. J. and M. Craig exhibit Mr. Buchan's well-known Disconnecting Siphon Trap, with fresh air-inlet directly over the water in the trap. The air-inlet is the same size as the trap, and where not fixed at great depth gives ready access to trap for cleaning purposes.

Messrs. Henry Doulton and Co. exhibit the Kenon Air-Chamber Floor, and Siphon Trap, designed by Professor Corfield, M.D., and myself, to give easy access to siphon and sewer, and to ensure a perfect bottom to the manhole. They are made to leave as little as possible to the workman when building. The inspection arm of siphon, giving access to sewer, is brought through wall to face of inlet to trap, and the floor forms a complete bottom to the air-chamber; thus no rendering in cement is necessary, and after fixing siphon and floor on course of drain, the workman has simply to build the walls of the air-chamber, put cover to same, and construct an air-inlet flue in cases where it is not desirable to put a plain open grate over the chamber.

Messrs. Doulton and Co. also exhibit the Kenon Air-shaft Trap, designed by me to provide an accessible and inexpensive substitute for the air-chamber and trap. This trap has two arms for vertical inlet shafts; the air-inlet is oblong on plan at bottom, with sides sloping upwards to the socket of the arm, which is made to receive ordinary 9in. stoneware pipes for extending the shaft up to where the air-inlet grating is to be fixed. The inspection arm can be continued up to ground level in like manner, thus affording access to drain on both sides of trap without excavating the ground.

Messrs. J. and R. Howie exhibit some good disconnecting traps, which are of exceptionally well-finished manufacture.

The North British Plumbing Company exhibit a cast iron air-chamber floor and siphon trap combined. Where iron drains are used the floor of the disconnecting chamber should certainly be of the same material, but the channels should be made to carry the sewage directly into the trap, which is not the case with the side channels in the floor exhibited.

VENTILATION OF HOUSE DRAINS.

In ordinary practice the ventilation of house drains can be effectively secured by continuing the soil pipes up to the roof, full bore. When fixed inside, these pipes should be of lead, and they should be protected from damage; but wherever practicable—and in all new buildings of course it is practicable—they should be fixed outside the house; and then for ordinary houses strong iron pipes have an advantage over lead, inasmuch as that while for all practical purposes they are as good, they are less expensive, and are less liable to be injured by ladders, &c. In cases where the first cost is not one of the principal considerations, of course very strong lead pipes will always be used.

All iron used in sanitary work should be protected

from rust by galvanizing, or by Professor Barff's process. Specimens of iron soil pipes, protected by the last-named process, are exhibited by the Bower-Barff Rustless Iron Company.

Sanitary authorities are not agreed about the use of cowls in connection with drain ventilating pipes; while some recommend them others dispute their use. There can be little doubt, however, that whether cowls are or are not useful in special cases, they are not necessary for the ventilation of house drains. A 4in. ventilating pipe, open at top, well above the roof, with the sides perforated near the end, is a simple and effective outlet ventilator.

VALVE WATER CLOSETS.

The Valve Water Closet is so generally admitted to be an excellent form of closet that, almost without exception, every sanitary engineer exhibits specimens of this apparatus. When well made, a valve water closet of good design, properly fitted up, is the most satisfactory closet apparatus yet devised for use inside a dwelling house. The pan closet apparatus, now, happily, discarded by all sanitary authorities, with all its serious defects did ensure a clean basin, and for this reason, no doubt, it held its ground so long. The valve closet ensures an absolutely clean basin, and can be fixed within a few inches of the trap, so that all the evils connected with the container of the pan closet are avoided.

Messrs. John Bolding and Sons exhibit the "Simplex" and the "Grosvenor" valve closets. The "Simplex" closet is a thoroughly good flushing rim apparatus in which, by means of a separate service pipe, the trap of the overflow is flushed out and recharged each time the closet basin is flushed. The "Grosvenor" valve closet has a disconnected overflow in connection with an outer rim, so that no surplus water is taken off before the basin is actually full. The overflow pipe may be made to discharge into the safe-tray of the closet or through the

wall separately, the object being to cut off all connection with the soil pipe. This, however, is an unnecessary precaution, for whenever it is dangerous to allow a properly trapped overflow pipe to discharge into the trap under the closet, the danger should be got rid of, and not the overflow pipe.

Messrs. Capper, Son, and Co. show a new valve closet, designed and patented by Mr. Pearson, in which the basin overflow and valve box are of one piece of earthenware. The overflow is trapped by the water standing in the closet basin, and thus the inlet to the overflow is below the water, which renders it liable to become choked by soil. Another defect, which could be easily remedied, is that to properly open the valve the handle of the closet has to be raised no less than 8in.

Mr. Henry Conolly exhibits two valve closets, in which the overflows form part of the earthenware basin, with inlet below water level in basin, an arrangement which is objectionable for the reason already stated, viz: that the overflows are always liable to be choked by soil. Mr. Conolly avoids this defect in his "Self-Trapping" valve closet, which has a trapped overflow connected to the flushing rim of the closet, so that the trap of the overflow is charged each time the closet valve is opened.

Messrs. Dent and Hellyer exhibit their "Optimus" valve closet, in every way a most excellent closet. It has a 2in. overflow pipe, the entrance to which is at the top of the basin, and the flushing rim of the closet is continued round the overflow arm, so that the overflow is flushed constantly with the closet. The inside of the valve-box is enamelled, and provision is made for a ventilating pipe.

Messrs. Emanuel and Sons have the "Phoenix" valve closet, a good apparatus, with trapped overflow charged from closet service by means of a pipe formed in the earthenware basin.

Mr. Geo. Jennings exhibits his "Improved Bramah"

valve closet, with trapped overflow, and socket for ventilating arm. This closet has a shallow basin and is well suited for places where the water supply is limited.

Messrs. Henry Owen and Co. exhibit a side outlet valve closet, in which the overflow is through the valve. This closet is well made, and is in many respects an admirable closet, but the force of the flushing water is partly lost by the outlet being at the side instead of at the bottom of the basin. The same may be said of the "European" side outlet valve closet, exhibited by Messrs. R. F. Dale and Co., the speciality of which is a quick siphon action overflow.

Messrs. J. Tylor and Sons exhibit several good Valve Closets, as do also the following makers:—Messrs. Doulton and Co., Messrs. J. and W. Farmiloe, Messrs. B. Finch and Co., Messrs. Hayward, Tyler, and Co., Messrs. Shanks and Co., Messrs. Sharp and Co., Messrs. J. G. Stidder and Co., and Messrs. John Warner and Sons.

PAN WATER CLOSETS.

The only Pan Closet exhibited in the Exhibition is Banner's patent closet, which is an ingenious contrivance for making this old offender as inoffensive as is possible; all the parts are of earthenware, and in order that the container may be constantly cleaned the closet basin is not a fixture. This closet is more complicated and only less objectionable than the old pan closet, and, though the evils connected with the container are minimised, the ingenious inventor has attempted the impossible in trying to make the pan closet a satisfactory sanitary apparatus.

Though no common pan closet is exhibited, many of the Exhibitors distribute price lists and circulars stating that they make and supply this dangerous apparatus. The regulations of the Exhibition provide that "all handbills, printed matter, &c., connected with exhibits, for gratuitous distribution, must first receive the approval and permission of the Executive Council." In the in-

terest of the public, this regulation ought to be enforced against the circulation, in the Exhibition, of papers recommending the use of the pan closet, which is, perhaps, the greatest enemy to health ever fixed in an English house, and which, owing to the ignorance of householders, is, at the present time, being put into hundreds of new houses in every part of the country.

PLUG WATER CLOSETS.

The Plug, or Plunger Water Closet, first introduced by Mr. George Jennings, has been largely used, and is, in many ways, a good apparatus. As with the valve closet, a body of water is retained in the basin to ensure cleanliness in use. The plug, or plunger, can, perhaps, be more easily repaired, in case of damage, than the valve, but the power of the flushing water in a plug closet is not so great as in the valve closet, by reason of the outlet being at the side instead of in the centre of the basin.

Mr. Geo. Jennings exhibits several well-made closets of this pattern, and varieties of the same closet are shown by other makers.

Mr. Pearson's "Twin-Basin" water closet, exhibited by Messrs. Capper, Son, and Co., is a form of plug closet. As its name implies, this closet has two basins; one is the closet proper, and in the other is fixed an ordinary supply valve with copper ball, thus converting the closet into a cistern, an achievement of extremely doubtful utility.

HOPPER WATER CLOSETS.

For closets fixed outside of the dwelling, or where they are to be used largely as slop sinks, the improved form of Hopper Basin, with flushing rim, is a cheap and satisfactory closet. With all forms of the hopper closet the closet should be flushed before as well as after use.

Messrs. Dent and Hellyer's "Hygienic" water closet is an improved form of the well-known "Artizan"

closet; it is an excellent closet, and can be fixed with either a lead or stoneware trap, as desired. The "Vortex" closet, also exhibited by Messrs. Dent and Hellyer, is designed to provide a larger body of water in the basin than is secured in the "Artizan" closet. This ensures a cleaner basin, but a much greater force of water is required than with the "Artizan" to cleanse the trap.

Messrs. Henry Owen and Co. exhibit an improved form of hopper closet, with large surface of water in basin, and Messrs. Sharp and Co. show their excellent flushing-rim hopper basin.

"WASH-OUT" WATER CLOSETS.

The "Wash-out" form of closet is that in which the outlet is at the back or side of the closet, and the bottom of the basin is so formed as to always hold some water. This water is just sufficient to prevent the stool adhering to the basin, but is not sufficient for the stool to be wholly covered by the water, as in the case of the valve closet, or with the improved hopper, and thus the maximum of unpleasantness is produced during the use of the closet, inasmuch as the stool is in great part exposed to the air of the closet-room until the closet has been flushed. Then when the closet is flushed, it is more apparent than real, for in great part the force of water has been wasted in driving the stool out of the hollow of the basin into the trap, which being out of sight may be out of mind, as with the trap under a valve closet; but the trap of a "wash-out" closet, though unseen, is exposed to the air of the closet-room in just the same way as the trap of the hopper closet, and owing to the break in the flushing power of the water, by reason of the inlet to the trap not being direct, the traps of "wash-out" closets too often retain deposit from the last stool.

The "wash-out" closet, however, with a specially

good supply of water and constant flushing, may be kept clean; and for hospitals, where it is necessary from time to time to examine the stools of patients, it may be used with advantage.

The "Monkey" water closet, exhibited at the Exhibition of 1851 by Mr. George Jennings, was the first form of "wash-out" closet made. It did not find favour at the time; and it is only within the last ten years that the "wash-out" closet has come much into use.

"Wash-out" closets" are shown by Messrs. Doulton and Co., the Hygienic and Sanitary Engineering Company, Mr. George Jennings, Messrs. Shanks and Co., Messrs. Stidder and Co., Messrs. J. Tylor and Sons, the West Central Sanitary Engineering Company, and other sanitary engineers.

TROUGH WATER CLOSETS.

For schools, factories, &c., Trough Closets are now coming largely into use, and several very good examples of this useful closet are shown in the Exhibition.

Messrs. Doulton and Co. exhibit a stoneware trough closet with their patent Automatic Flush Tank. Messrs. Bowes Scott, and Read, exhibit their Patent "Self-Cleansing" trough closet, made of stoneware, with any number of seats required, and having a galvanized iron flushing cistern, fitted with Field's patent Annular Siphon, by means of which the closet is automatically flushed at regular periods. Messrs. Wilcock and Co. exhibit Holroyd's patent "Sanitary Flushing" closet, which is another excellent trough closet, made of stoneware throughout, and fitted with an automatic flushing cistern.

The apparatus connected with each of these trough closets is absolutely automatic in its action, and in neither of them are there any valves, plugs, or any moving parts to get out of order, which strongly recommends them for use in such institutions as schools and factories,

where a large number of persons have to be accommodated at one time.

WATER CLOSET TRAPS.

Cast lead siphon or V dip traps are the best for use in connection with closets of all kinds, where the trap cannot be directly connected to the drain. With basement closets, stoneware siphon traps should be used, but there is danger in using a stoneware trap in connection with any closet discharging into a metal soil pipe, on account of the difficulty of making a joint between metal and stoneware that will remain absolutely perfect. When the joint between metal and stoneware is made on the house side of the trap, all risk of drain-air entering the house through a defective joint is obviated, the trap being between the joint and the house. It is scarcely necessary here to condemn D traps, as none are shown in the Exhibition, excepting in connection with the Unsanitary House.

SOIL PIPES.

Under all circumstances so far as Soil Pipes are inside a dwelling-house they should be of lead—the patent drawn lead pipe is the best; but outside of the building strong cast iron pipes, carefully jointed, may be used. All iron pipes should be galvanized, or protected against rust by Professor Barff's process. Soil pipes should be continued up to the roof, full bore, for outlet ventilation, and their connection to drain should be direct, without any intervening trap. For public buildings and for houses where the cost of very heavy lead pipes may be incurred, they should be used in preference to iron pipes, but for ordinary work good iron pipes are in every way satisfactory.

CHAMBER-SLOP SINKS.

Only in large houses is it necessary to provide chamber-slop sinks, as in ordinary cases the slops may be

thrown down the water closets. When slop sinks are put in, they should be treated in every way as if they were water closets. They should discharge into a soil pipe, or, where this is not possible, their waste pipes should be taken directly into the drain, and be continued up to roof, full bore, for outlet ventilation.

Messrs. Bolding and Sons exhibit some good slop sinks in enamelled iron, and the slop sinks shown by Messrs. Dent and Hellyer are all that could be desired; their Hospital slop sink in white stoneware, with flushing rim, is a particularly good sink.

Several combination sinks are shown in which the slop sink is at one end of a slate slab, the greater part of the slab being used as a washing sink, an arrangement which is obviously objectionable. To ensure cleanliness, every chamber-slop sink should be as separate and distinct as a water closet.

URINALS.

Special care is required in fitting up urinals to ensure a good and regular supply of flushing water, particularly when in connection with a dwelling-house. The waste pipes from urinals should be treated in the same way as pipes from water closets.

Messrs. Bolding and Sons exhibit Mr. McGill's patent Stall Urinal, circular on plan, and made of earthenware throughout, which is a great improvement on the old form of stall urinal.

Messrs. J. Tylor and Sons exhibit their excellent patent "Flush-out" urinal basin, in which water is always retained in the basin. Many other good urinals are also exhibited, which, however, do not call for special notice.

BATHS.

A Bath Room with a fixed bath is a great desideratum in every household. A fixed bath should have a waste pipe of at least $1\frac{1}{2}$ in. diameter, and care should be taken

that the waste valve is of equal capacity. The services to the bath should never enter the bath through the waste, they may be over the bath, but are best when they discharge near the bottom, as the hot water does not then generate steam.

Excellent baths are now made of copper, steel, cast iron, porcelain and concrete. Good cheap baths are also made of strong zinc. Of the many examples shown in the Exhibition, the following may be specially mentioned as meeting every sanitary requirement:—

Enamelled copper baths by Messrs. Benham and Sons, Messrs. John Bolding and Sons, Mr. Henry Conolly, Messrs. Doulton and Co., Messrs. Ewart and Sons, Mr. Geo. Jennings, Messrs. Shanks and Co., Mr. John Smeaton, Messrs. J. Tylor and Sons, Messrs. Waller and Co., and the West Central Sanitary Engineering Co.

Enamelled cast iron baths by Messrs. Clements Jeaks and Co., Mr. S. Owen, Messrs. Shanks and Co., and Messrs. J. Tylor and Sons.

Enamelled tinned steel baths, stamped and seamed in the same way as an ordinary copper bath, by Messrs. B. Perkins and Sons.

Porcelain baths by Messrs. Joseph Cliff and Sons, Messrs. Benjamin Finch and Co., and Messrs. John Hall and Co.

Polished concrete baths by Messrs. Charles Drake and Co.

LAVATORIES.

Lavatory basins in great variety are shown by all the exhibitors of sanitary appliances. The "Tip-up" basin is a favourite with many, on account of the quickness with which it is emptied, but this advantage is more than counterbalanced by the greater attention required to keep clean the large receiver into which the basin discharges. The best lavatories are those having

fixed basins with a flushing rim supply, and with a $1\frac{1}{2}$ in. waste pipe from the bottom of the basin.

WASHING SINKS.

Sinks used for washing purposes are important sanitary features in connection with all dwelling houses. Each washing sink should have its separate waste pipe, which should seldom be less than $1\frac{1}{2}$ in. in diameter.

Scullery Sinks for small houses may be of York stone, enamelled or galvanized iron, stoneware, or concrete, but in large houses, in the interest of plates and dishes, deal sinks lined with strong lead or tinned copper may be used with advantage.

Pantry or Still Room Sinks should be lined with wood. The well-known patent sink exhibited by Mr. Geo. Jennings is, perhaps, the best pantry sink yet devised. This sink made in galvanized or enamelled iron is also admirably suited for small dwellings, as it may be used as a washing tub, and will make a capital child's bath.

Kitchen Sinks in large houses are sometimes used for washing vegetables. All sinks used for such purposes should be made of porcelain, slate, or some enamelled material.

Housemaid's Sinks are best when made of deal and lined with lead, for the reason that they are less liable to breakage in themselves, and less dangerous to bottles and jugs than stoneware or iron sinks.

WASTE PIPES.

The waste pipes from baths, lavatories, and washing sinks should be of lead so far as they are inside a dwelling house, but outside they may be of galvanized or Barffed iron. As a rule these waste pipes should be $1\frac{1}{2}$ in. in diameter, but in the case of baths larger pipes may well be used. Each waste pipe should have a cast lead siphon trap, with inspection cap, as near to bath,

lavatory, or sink as possible, and should discharge into a stoneware siphon gully outside the house, the top and bottom of the waste pipe being open for ventilation. All waste pipes receiving hot water should be of extra strength. It is always an advantage for baths, lavatories, and sinks to be fitted with overflow waste pipes, particularly when they are situated on wood floors, indeed, with all plug wastes, overflow waste pipes should be considered necessary.

STORE CISTERNS.

The storage of water for household purposes has not hitherto received a tithe of the attention due to its importance. Flushing cisterns for water closets and drains are shown in great variety, but with one or two exceptions the manufacturers and sanitary engineers at the International Health Exhibition leave to the imagination of the visitor the source from which the water is supplied to the innumerable bib cocks and valve apparatus of all kinds on view.

Messrs. Broad and Co. exhibit small white enamelled stoneware cisterns for drinking-water, and Messrs. Brooke and Sons show some larger stoneware cisterns specially made for artizans' dwellings.

For drinking purposes a stoneware or glass cistern is obviously preferable to all others. Slate cisterns may be classed next, and except for soft water little objection can be taken to lead lined cisterns, while for general purposes galvanized iron cisterns are cheap and fairly satisfactory. Cisterns should always be placed where they may be examined and cleaned out without difficulty. In the last century it was the fashion to make the cistern ornamental, and to fix it in a conspicuous place, a practice which might well be followed in the present day. Manufacturers of glass and earthenware have a great field open to them in the supply of improved cisterns.

All services from cisterns should be a little above the bottom of the cistern, and where the same cistern supplies hot and cold services, the cold water services should all be a few inches above that connected with the hot water apparatus.

FLUSHING CISTERNS.

Valve water closets are best flushed by means of a supply from an ordinary cistern with a regulator valve under the seat. The closet cistern may be supplied from the general household cistern, but no draw-off tap should be served from any cistern directly supplying a water closet or chamber-slop sink.

In all cases where a waste preventing cistern is used to supply a valve water closet it should have an after-flush arrangement to ensure the water necessary to fill the basin after the valve is closed. An after-flush is also necessary with plug closets. With hopper and "wash-out" closets it is now the rule to fix water waste preventing cisterns; those with siphon action are in every way the best, and they should be of galvanized or Barffed cast iron.

The London Water Companies as well as the makers themselves exhibit every variety of water waste preventing cistern and other water supply apparatus.

For large houses it is sometimes desirable to provide for a periodical flushing of the drains, and this is best done by means of an automatic flush tank, in which is fixed an Annular Siphon first introduced by Mr. Rogers Field. Automatic flush tanks are shown in action by Messrs. Doulton and Co., Messrs. Bowes Scott and Read, and Messrs. Wilcock and Co.

OVERFLOW WASTE PIPES.

Every cistern should have an overflow waste pipe, but it is a mistake to discard the old standing waste in favour of the simple pipe from the top of the cistern.

The standing waste may be made to discharge into the open as easily as a pipe from the top of the cistern, and when the standing waste is removed the opening at the bottom of the cistern supplies the necessary outlet for the periodical cleansing of the cistern.

Overflow waste pipes to baths, lavatories, and sinks should be connected to the waste pipes above the traps.

SAFE-TRAYS.

Under water closets, baths, and cisterns on wood floors lead safe-trays should be fixed with waste pipes of sufficient capacity to carry off possible overflow. Care should be taken that the trays are laid to a proper fall, so that all water may be taken away by the waste. The waste pipe from a tray under a water closet or cistern should be taken straight to the open air with a hinged metal flap trap to keep out draught. With baths it is a good plan to make one waste pipe serve for bath and tray, in which case, there being a siphon trap on the waste, no flap trap is required.

RAIN WATER PIPES.

Rain water pipes wherever they are fixed inside a building should be of lead, but outside they may be of galvanized or Barffed cast iron. All rain water pipes should discharge into open stoneware siphon gullies. Rain water heads should be protected from leaves, &c., getting inside, and they should have an overflow lip, or shoot, so that in case of any stoppage in the pipe, or in the event of storm water being in excess of the capacity of the pipe, the overflow may be thrown away from the walls of the building.

CONCLUSION.

The foregoing notes briefly describe some of the chief sanitary exhibits at the International Health Exhibition, so far as they come within the province of the

architect. Within the limited scope of this paper it has been impossible to notice more than a comparatively few exhibits in detail, but I have included in the notes some remarks on the principles regulating good sanitary arrangements connected with the drainage of dwelling houses, which may be found useful in inspecting apparatus not described.

It may be mentioned that Plans of Sanitary Arrangements connected with the efficient drainage of an ordinary town house are shown in the Exhibition by the Sanitary Assurance Association.



APPENDIX.

THE SANITARY ASSURANCE ASSOCIATION,

5 ARGYLL PLACE, REGENT STREET, W.

To promote and maintain good Sanitary Arrangements in the Houses of all Classes of the Community.

President.

Sir JOSEPH FAYRER, K.C.S.I., M.D., F.R.S.

Vice-President.

Professor T. ROGER SMITH, F.R.I.B.A.

Honorary Council.

The Rt. Hon. EARL FORTESCUE; The Rt. Hon. LORD WOLSELEY.

Sir W. ROBINSON, K.C.S.I.; Sir R. TEMPLE, Bart., G.C.S.I.

Capt. V. LOVETT CAMERON, C.B., R.N.; ANDREW CASSELS, Esq.

R. BRUDENELL CARTER, Esq., F.R.C.S.; A. CATES, Esq., F.R.I.B.A.

EWAN CHRISTIAN, Esq., F.R.I.B.A.,

President of the Royal Institute of British Architects.

NORMAN CHEVERS, Esq., C.I.E., M.D.

JOHN ERIC ERICHSEN, Esq., F.R.S.,

Late President of the Royal College of Surgeons.

Dr. R. B. FARQUHARSON, M.P.; Professor E. FRANKLAND, F.R.S.

Captain DOUGLAS GALTON, C.B., F.R.S.,

Chairman of the Council of the Parkes Museum of Hygiene.

ALEXANDER B. W. KENNEDY, Esq.,

Professor of Engineering, University College.

The Hon. CHANDOS LEIGH; J. NORMAN LOCKYER, Esq., F.R.S.

Professor JOHN MARSHALL, F.R.S.

WILLIAM MACKENZIE, Esq., M.D., C.B.; W. S. PLAYFAIR, Esq., M.D.

G. V. POORE, Esq., M.D.,

Professor of Medical Jurisprudence, University College.

GEO. J. ROMANES, Esq., F.R.S.

E. H. SIEVEKING, Esq., M.D., F.R.C.P.; H. P. SYMONDS, Esq., F.R.C.S.;

Professor JOHN TYNDALL, F.R.S.; Major H. TULLOCH, R.E.

JOHN WHICHCORD, Esq., F.R.I.B.A.; Colonel H. YULE, C.B.

Executive Council.

Sir JOSEPH FAYRER, K.C.S.I., M.D., F.R.S.—PRESIDENT.

T. ROGER SMITH, Esq., F.R.I.B.A.—VICE-PRESIDENT.

Professor of Architecture, University College.

Lieut.-General H. K. BURNE, C.B.

GEORGE AITCHISON, Esq., A.R.A.,

Fellow of the Royal Institute of British Architects.

F. DE CHAUMONT, Esq., M.D., F.R.S.,

Professor of Hygiene, Army Medical School.

MARK H. JUDGE, Esq., SANITARY SURVEYOR.

Associate of the Royal Institute of British Architects.

V. B. BARRINGTON KENNETT, Esq., M.A.,

Member of the Metropolitan Asylums Board.

HENRY RUTHERFURD, Esq., Barrister-at-Law.

ANDREW STIRLING, Esq.

JAMES STEVENSON, Esq., M.D.—CHIEF MEDICAL OFFICER.

Medical Officer of Health for Paddington.

GEORGE DANFORD THOMAS, Esq., M.D.,

Coroner for Central Middlesex.

Secretary.

JOSEPH HADLEY, Esq., 5, Argyll Place, Regent Street, W.



SANITARY ASSURANCE ASSOCIATION.

THE Sanitary Assurance Association was the result of efforts which were made in London in 1880 to bring together Medical Men and Architects in connection with the important question of house sanitation, and the Association was instituted on November 1st in that year at a meeting held at the Langham Hotel, under the presidency of Sir JOSEPH FAYRER, K.C.S.I., M.D., F.R.S., who, in his address to the meeting, said :—

“I would venture to offer no opinion as to the nature of the diseases that proceed from sewer air, nor even enter into any discussion on the precise character of the air—the nature of the germs and the character of the poisons that it communicates; but that it does destroy health and induce disease is beyond a doubt. That it is greatly under the control of sanitary law is equally certain, and there are men now who have so studied and comprehended the nature of those laws, that they are able, practically, as well as theoretically, to give that assistance and that advice which should render those conditions almost innocuous—in fact it should prevent them altogether. This is a source of anxiety to everybody. I believe you will scarcely meet with a householder who has it not more or less on his mind—‘What is the condition of the drainage of my house?’ It is all underground. He cannot see it, and perhaps the first communication he receives that it is not right is that his child has diphtheria, typhoid, or some low form of blood

poisoning. The object of this Association seems to me to be to prevent this. It is, as far as possible, to do away with the *causes* that give rise to these things, and then the *effects* will cease. As far as science, architecture, and medicine combined can prevent these things, I think they will certainly tend to do so, and so I feel that it is a most desirable undertaking, and I am sure that it merits well the co-operation, both of my own profession and of the architectural profession—in fact, of all science.”

The Association was incorporated on February 12th, 1881, under a license of the Board of Trade, and its chief object is to apply the combined sanitary knowledge and experience of medical men, architects, and others, by means of specially qualified officers, who shall inspect houses and report upon their drainage, water-supply, and ventilation, on such terms as may include the dwellings of all classes of the community.

Within certain areas the law requires that some provision for house drainage shall be made; but it is not as yet required, nor is it desirable, that public officers should visit every inhabited house for the purpose of regulating its internal arrangements. On the other hand, it is by no means satisfactory that any house should be left without examination when it is remembered that from a single dwelling the poison of infection may spread, through defective sanitary arrangements, and seriously injure a whole neighbourhood.

The Sanitary Assurance Association enables any person to have the sanitary condition of his house reported on by those specially skilled in sanitary matters, for a moderate fee, a form of expenditure by which a prudent householder would rather discover the condition of his house than by the disastrous and costly results of an outbreak of serious and perhaps fatal disease.

An Assurance Register is kept at the office of the

Association, 5, Argyll Place, Regent Street, W. All houses placed in the hands of the Association for inspection are entered in this register and are then inspected by the Sanitary Surveyor who supplies the member or subscriber with a written report thereon, also a specification describing in detail what work is required to put the house into a proper condition, so far as drainage, water supply and ventilation are concerned. After a house has been reported on, and the member or subscriber has had the work done by his own builder, to the satisfaction of the Medical Officer and the Sanitary Surveyor, a certificate is granted. The certificate is transferable with the property, and for a renewal of the certificate by endorsement an annual inspection is made by the Association.

The carrying out of works recommended is quite optional, but unless the work is executed under the supervision of the Association, the sanitary condition of the property is not certified.

In addition to supervising the sanitary arrangements of houses already built, the Association examines and reports on plans of drainage, etc., and also furnishes plans and specifications for sanitary arrangements in connection with new buildings of every kind.

The management of the Association is vested in the Executive Council, and in order to secure that special knowledge which the nature of the work demands, the Articles under which the Association is incorporated provide that at least one half of this Council shall consist of medical men and architects.

The income and property of the Association are applied solely towards the promotion of its objects, and no portion thereof can be paid by way of dividend or profit to the members or subscribers. From time to time the Association publishes reports on matters connected with house sanitation.

Professor F. DE CHAUMONT, M.D., F.R.S., a Member of the Executive Council, in a Lecture at the London Institution (since published by the Association), said :—

“ We have in this country a considerable jealousy of State interference, and to a large extent this feeling is a satisfactory one, and encourages a spirit of independence. It may, however, be doubted whether it is not sometimes carried too far, so as to impede progress in certain directions, and whether, without desiring to introduce ‘grand-motherly legislation,’ it might not be well to give wider scope to the action of the State in these matters. Certain of the larger hygienic questions are undoubtedly the province of the State, and have to some extent been provided for by existing Acts; but when we come to the question of direct compulsory inspection of every dwelling house by an appointed official, it is felt that there would be a good deal of opposition to this, and that at least at present there would be some difficulty in getting the principle generally recognised. It may ultimately come to that, but legislation to be really successful must never go far beyond the wishes or the comprehension of the people, and it is therefore likely that the carrying out of any such measure would hardly be sanctioned by Parliament or by public opinion at the present time. That being the case, it is desirable that the work should be undertaken by private enterprise, so that the good desired may not be unduly delayed, and also with the view of educating the community up to the necessary level of intelligence and appreciation, and so paving the way for more extended measures similar to those which we reasonably hope will now prove a success when undertaken on the voluntary principle. The Sanitary Assurance Association will thus have a part in initiating a movement which is likely to be fraught with the greatest possible benefit, not to this country alone, but to mankind at large.”

Mr. JOHN ERIC ERICHSEN, F.R.S., late President of

the Royal College of Surgeons, and a member of the Honorary Council of the Association, presided on the occasion of Professor De Chaumont's lecture at the London Institution. In the course of some remarks at the close of the lecture Mr. Erichsen said :

"It is impossible to have heard Professor De Chaumont's lecture without feeling that he has most thoroughly convinced all who have listened to him that the objects of the Association which he has advocated are such as are likely to bring the very best, most accurate, and most scientific information with regard to sanitary matters within the easy reach of every member of the community, and so to put every one in possession, at all events, of that knowledge which would enable him to acquire that greatest of all blessings to himself and to his family—a healthy home. * * * *

"There is nothing that more distinguishes the civilized man from the savage, or the educated man from the man who is unenlightened, than the scrupulous attention that the civilized and educated man pays to what is, after all, the first law in hygiene—cleanliness in all the actions of his body, and all the surroundings of his home. The culture of the civilized man inclines him to it. It becomes almost instinctive. The knowledge acquired by the educated man compels him to it, for if there is one truth that is more determinedly established by modern science than another it is this—that a vast number of these diseases, as Dr. De Chaumont has so eloquently told us to-night, which devastate mankind are *preventible*, and being preventible and *not prevented*, they are self-inflicted. And it is not only, as Dr. De Chaumont has told us, those more fatal diseases the typhus, and the typhoid, and the plague, and the diphtheria, that are so preventible, and that constantly by want of prevention we inflict upon ourselves. There is also a vast host of the minor diseases that tend to sap greatly the strength

and to diminish the happiness of existence, such, as we have been told, are the tendencies to colds, the tendencies to sore throats, lassitude, and low spirits, irritability, and various kinds of indigestion, and of a lower tone of health altogether—these conditions are tendencies rather than diseases, and these tendencies rather than diseases arise equally from the breach of sanitary laws; for just as a breach of the moral law brings prick of conscience and agony of remorse, so the infraction of sanitary law brings in its train unquestionable suffering in some shape or another, and disease.”

The Third Annual Meeting of the Association was held on February 25th, 1884, when the Executive Council in the Report for the year 1883 said:—

“The inspection of houses, supplying of reports as to their sanitary condition, specifications of works required to remedy defects, supervision of such works and issue of certificates have been continued on the plan initiated by the Association in 1881. The property inspected has again been of the most varied description, the rateable value being in some cases as low as £10, whilst in others it has exceeded £1,000, but in all cases the sanitary arrangements have been found to be more or less defective. The annual inspections have shown that the houses certified by the Association have remained in perfect sanitary condition.

“Three lectures, to which the public were admitted free, have been given since the Second Annual Meeting. On 9th May, HENRY RUTHERFURD, Esq., Barrister-at-law, Member of the Council, lectured on ‘Sanitary Assurance from a Householder’s Point of View.’ On 23rd May, NORMAN CHEVERS, Esq., C.I.E., M.D., lectured on ‘London Ædiles, an Address upon the Objects of the Sanitary Assurance Association.’ On 6th June, Captain DOUGLAS GALTON, C.B., F.R.S., Member of the Honorary Council, and Chairman of the Council of the Parkes Museum of

Hygiene, delivered a lecture on 'The Advantages of Co-operation in Sanitary Matters.'

"At the second lecture the following resolution was unanimously passed, on the motion of Mr. WILLIAM WHITE, F.R.I.B.A. :—'That the Council of the Association be requested to consider whether they cannot recommend legislation compelling the builders of all new dwellings to obtain a certificate from some authority or qualified person as to the sanitary condition of such dwellings before it shall be lawful for them to be inhabited.' The Executive Council have appointed a sub-committee to consider how best the objects of the resolution can be attained."

The Association thus continues to make progress, and it entered on its fourth year of work with a financial balance in hand, after meeting all liabilities. A prospectus, with full particulars of the Association, may be had on application to the Secretary, Mr. JOSEPH HADLEY, at the Office, 5 Argyll Place, Regent Street, W.





